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DAILY CURRENT AFFAIRS

FOR UPSC CIVIL SERVICE EXAMINATION

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1. India-US Tensions under Trump: Will India Tilt Towards Russia-China Axis?

• Recent US Actions Against India

- Former US President Donald Trump imposed a **25% tariff** on Indian goods and threatened further penalties for India's trade with **Russia**, especially in **oil and defence sectors**.
- He accused India of **"obnoxious" non-monetary trade barriers** and the **highest global tariffs**, criticizing its protectionist approach.

• Triggers Behind Trump's Discontent

- **India's refusal to open up its agriculture sector** during trade negotiations frustrated Trump.
- He opposed India's ties with **Russia (oil and arms deals)** and its **membership in BRICS**, which he views as anti-Western.
- India's **dismissal of Trump's role** in resolving a previous India-Pakistan skirmish may have added to the tension.
- Meanwhile, Trump finalized a **trade deal with Pakistan**, signaling a diplomatic tilt.

• Concerns Over India Moving Closer to Russia-China

- India has long maintained **strategic autonomy** in foreign policy.
- While some experts fear a **recalibration** toward the **Russia-China axis**, India's **multi-alignment approach** remains central.
- China has recently backed reviving the **Russia-India-China (RIC) trilateral**, amid improving post-Galwan ties between India and China.

• India's Strategic Response & Foreign Policy Stand

- India's reaction has been **measured and diplomatic**.
- The External Affairs Ministry emphasized that **India-US ties are resilient**, rooted in **shared democratic values and people-to-people links**.
- India reiterated its right to defend national interests and pursue **equitable trade negotiations**.

• Way Forward for India

- India should focus on **removing trade irritants** with the US and aim for a **balanced and beneficial trade agreement**.
- Continue strategic engagement with **Russia**, but reduce overdependence, especially in the defence sector.
- Strengthen ties with **all major global powers** under its **multi-aligned policy**, avoiding binary alignments.

• Constitutional & Legal Context

- **Article 51 of the Indian Constitution** guides India to promote **international peace and friendly relations**.
- **India's Foreign Trade Policy** and various bilateral treaties govern commercial engagements with the US and Russia.

Conclusion and UPSC Relevance
India's foreign policy is being tested amid volatile global geopolitics and transactional US diplomacy. Despite temporary setbacks, **India must maintain a balance between strategic partnerships with the US and traditional ties with Russia**, while managing rising China pragmatically.
UPSC Relevance: This topic is highly relevant for **GS Paper 2 (International Relations)** – India's foreign policy, strategic autonomy, major bilateral ties (India-US, India-Russia, India-China), and multi-alignment strategy. Also important for **Essay and Interview** preparation.

2. Review of International Co-operation Scheme for MSMEs: Key Insights

• Background of the Scheme

- The **International Co-operation Scheme (2019)** by the **Ministry of MSME** provides **financial support** to promote international exposure and capacity building for Indian MSMEs.
- It reimburses costs such as **airfare, stall rentals, participation in global events, international seminars, and quality certification**, especially supporting **first-time exporters**.

• Reasons for Ongoing Review

- The scheme is being reviewed due to **rising global geoeconomic uncertainties**, **tariff wars**, and **disrupted global supply chains**.
- The review aims to assess the **impact of the scheme on MSME exports**, especially for **new entrants in global trade**, and to refine it for greater effectiveness.

• Implementation and Participation Constraints

- In **FY24**, **545 MSMEs** were supported with **₹19.22 crore** under the scheme.
- MSMEs must be registered under the **Companies Act** or **Societies Act**, and comply with regulatory requirements like **GST**, which is often a **barrier for smaller players** lacking financial and administrative resources.

• Export Challenges Faced by MSMEs

- MSMEs contribute to nearly **45% of India's exports**, yet **40% of them were directly or indirectly affected** by tariff-related disruptions, as per the **SIDBI MSME Survey Outlook (April-June 2025)**.
- Lack of **market access, sales strategy, and promotional knowledge** further hinders their international growth, as highlighted in the **U.K. Sinha Committee Report (2019)**.

• Operational Limits and Eligibility Conditions

- MSME industry associations can participate in a **maximum of three events per year**, and the **same event only for three consecutive years**. A **two-year gap** is required before repeat participation.
- Financial aid is also extended for **export registration certificates**, **membership in export councils**, and **international quality certification fees**.

• Legal and Institutional Framework

- **MSME Development Act, 2006**: Forms the legislative basis for government policy and promotion of MSMEs.
- **Companies Act, 2013** and **Societies Registration Act, 1860**: Define legal eligibility for scheme participation.
- **Article 19(1)(g)** of the Constitution guarantees the **freedom to practice any trade or business**, which includes access to global markets.

Conclusion and UPSC Relevance

The review of the International Co-operation Scheme reflects India's adaptive approach to strengthening its MSME sector amid global trade uncertainties. MSMEs are the **backbone of India's economy**, and their international competitiveness is crucial for inclusive economic growth. Policymakers must enhance the scheme's **accessibility, transparency, and strategic focus** to make Indian MSMEs globally resilient.
UPSC Relevance: Important for **GS Paper 2 (Governance, Government Schemes)** and **GS Paper 3 (Economy, MSME Sector, External Sector)**. Also useful in **Essay and Interview** on themes like *Atmanirbhar Bharat*, *Inclusive Growth*, and *Export Competitiveness*.

3. India's New Climate Finance Taxonomy: A Strategic Step Towards Green Transition

• What is Climate Finance Taxonomy?

- A **taxonomy** is a classification system that defines which economic activities and assets qualify as **climate-aligned investments**.
- India's upcoming **Climate Finance Taxonomy (CFT)** will define eligible projects under climate finance in terms of **mitigation**, **adaptation**, and **transition**, aligned with **Paris Agreement** goals and India's **Net Zero by 2070** target.

• Purpose and Need for the Taxonomy

- To bring **clarity, credibility, and consistency** in identifying climate-friendly investments.
- Aimed at **mobilizing capital**, both **public and private**, for clean energy, sustainable development, and **decarbonization** of critical sectors.
- Will act as a safeguard against **greenwashing**—the practice of falsely labeling projects as environmentally friendly.

• Key Features of the New Framework

- **Hybrid classification** model covering **climate-supportive** and **transition-supportive** investments.

- Special focus on **MSMEs**, **adaptation finance**, and sectors that are **hard-to-abate** like steel and cement.
- Proposes a **phased rollout**:
    - *Stage 1*: Foundational taxonomy with principles and classification methods.
    - *Stage 2*: Detailed sector-specific annexures.
- Designed to align with India's **energy security**, **Net Zero targets**, and **Viksit Bharat 2047** development vision.

• Institutional and Policy Framework

- The taxonomy is being developed by the **Department of Economic Affairs (Ministry of Finance)** in consultation with experts, industry, academia, and global bodies.
- Mentioned in the **Union Budget 2024–25** by Finance Minister Nirmala Sitharaman as part of India's climate finance agenda.
- Anchored in India's commitments under the **Paris Agreement (UNFCCC)** and **SDG 13 (Climate Action)**.

• Benefits and Strategic Implications

- Enhances **investor confidence** and facilitates access to **green capital markets**.
- Enables **policy alignment**, resource planning, and accountability in India's green transition.
- Encourages **innovation in indigenous green technologies** and supports job creation in green sectors.

• Constitutional and Legal Basis

- **Article 48A** of the Indian Constitution: Directs the State to protect and improve the environment.
- **Environment Protection Act, 1986**: Legal framework for environmental standards and green regulation.
- **Companies Act, 2013 (CSR Provisions)**: Enables corporate contribution to climate goals.

Conclusion and UPSC Relevance

India's Climate Finance Taxonomy marks a landmark policy intervention for steering financial flows towards a **low-carbon and climate-resilient economy**. It not only supports **sustainable growth** but also reinforces India's global climate leadership. As India progresses towards **Net Zero by 2070** and **Viksit Bharat 2047**, this taxonomy will be crucial in bridging the **climate finance gap** and integrating green finance into the mainstream economy.

UPSC Relevance: Crucial for **GS Paper 3 (Environment, Economy, Climate Change, Energy)**, **GS Paper 2 (Governance, International Commitments)**, and **Essay Paper**. Also relevant for **Prelims** (Government schemes, Sustainable Development) and **Interview** discussions on climate governance and green economy.

4. Bio-Fortified Potatoes in India: A Step Towards Nutritional Security

• What are Bio-Fortified Crops?

- **Bio-fortification** is the process of increasing the nutritional value of crops through **breeding or biotechnology** to address micronutrient deficiencies.
- In this case, **bio-fortified potatoes** with enhanced **iron content** are being introduced to combat **iron-deficiency anemia**, a major public health issue in India.

• Current Developments and Institutional Collaboration

- The **International Potato Center (CIP), Peru**, has developed iron-rich potato varieties and is collaborating with **ICAR's Central Potato Research Institute (CPRI), Shimla** for adaptation to Indian conditions.
- Evaluation by ICAR is ongoing; once suitable for Indian agro-climatic zones, the variety will be released for **widespread cultivation**.

• Other Bio-Fortified Crops Already in Use

- **Bio-fortified sweet potatoes rich in Vitamin A** are already available in **Karnataka, Assam, West Bengal, and Odisha**.
- These are intended to reduce **Vitamin A deficiency**, especially in children and women, and have been developed using **CIP technology**.

• Establishment of CIP South Asia Regional Centre in Agra

- Dr. Simon Heck, DG of CIP, is visiting India to initiate the **South Asia regional center of CIP in Agra**, which will facilitate regional research and farmer outreach for **nutrient-rich tuber crops**.
- This center will also serve as a **hub for technology transfer, seed distribution, and crop evaluation**.

• Nutritional and Public Health Significance

- India faces a **high burden of micronutrient deficiencies**, especially **iron deficiency**, contributing to anemia among women and children.
- Bio-fortified crops can be **cost-effective, sustainable interventions** to improve nutrition, particularly in **low-income rural populations**.

• Constitutional and Legal Provisions

- **Article 47**: Directs the State to raise the level of nutrition and standard of living of its people.
- Supported by schemes like **POSHAN Abhiyaan**, **National Nutrition Mission**, and **ICDS**, which aim at addressing malnutrition and micronutrient deficiencies.

Conclusion and UPSC Relevance

The introduction of bio-fortified potatoes marks an important step in India's efforts to **integrate agriculture with public health and nutrition goals**. It reflects a shift towards **nutrition-sensitive farming** and science-backed crop development to meet **SDG-2 (Zero Hunger)** and **SDG-3 (Good Health and Well-being)**. Government collaboration with global agricultural research institutions like CIP is critical for ensuring **food security and health equity**.

UPSC Relevance: Important for **GS Paper 2 (Health, Welfare Schemes)**, **GS Paper 3 (Agriculture,**

Biotechnology, Food Security), and **Essay** topics on nutrition, agricultural innovation, and rural development.

5. Right to Repair, Tacit Knowledge, and India's Repair Economy: A Policy Imperative

• Introduction to Repairability and Policy Shift

- In May 2025, India accepted a proposal for introducing a **Repairability Index** for mobile phones and appliances, to rank products based on **ease of repair**, **spare part access**, and **software support**.
- This aligns with global trends like the **Right to Repair movement**, encouraging **product longevity** and **consumer empowerment** while reducing **e-waste**, which reached **1.6 million tonnes in India (2021-22)**.

• Tacit Knowledge and Informal Repair Economy

- **Tacit knowledge** refers to skills and expertise passed through **observation, mentorship, and hands-on experience**, often undocumented.
- India's vast informal repair sector—e.g., **mobile fixers in Karol Bagh**, **appliance repairers in Ritchie Street**—represents a **knowledge-rich, sustainability-driven ecosystem**, yet remains **largely excluded from formal skilling and policy frameworks**.

• Current Gaps in Digital and Skilling Policies

- Initiatives like **PMKVY** and **NEP 2020** promote structured learning but fail to support the **improvisational and adaptive nature** of repair work.
- The **E-Waste (Management) Rules, 2022** emphasize recycling under **Extended Producer Responsibility (EPR)** but **overlook repair** as a first-line sustainability solution.
- Lack of formal recognition under platforms like **e-Shram** further marginalizes informal repairers.

• AI, Sustainability, and Design for Repairability

- Most modern devices are **not designed for disassembly**, making repairs harder (only **23% of smartphones in Asia are easily repairable**, per 2023 iFixit report).
- As India builds **AI infrastructure and Digital Public Infrastructure (DPI)**, there's a need to embed **repairability into design norms and procurement standards**, promoting **'design for unmaking'**.
- **Large Language Models (LLMs)** and decision trees can be used to **codify and share tacit repair knowledge** without stripping it of local context.

• Institutional and Policy Recommendations

- **Ministry of Electronics and IT**: Embed repairability in AI design and hardware procurement.
- **Department of Consumer Affairs**: Expand the **Right to Repair** to cover more product classes and community participation.
- **Ministry of Labour**: Recognize informal repairers under **e-Shram** for **social security and skilling**.

- **Ministry of Skill Development**: Design training to reflect **non-standard, intuitive, and adaptive** repair skills.

• Legal and Constitutional Frameworks

- **Article 21** (Right to Life) implies access to sustainable, repairable technology as part of a dignified life.
- **Article 48A** promotes environmental protection, supporting repair and reuse over disposal.
- India's commitment to **SDG 12 (Responsible Consumption and Production)** also backs repair-centric circularity.
- The **Right to Repair Framework (2022)** and national portal (2023) lay the groundwork for consumer-friendly sustainability norms.

Conclusion and UPSC Relevance

The recognition of repair as both a **consumer right** and a form of **cultural-intellectual knowledge** is crucial for a sustainable, inclusive digital future. Repairers are **not just service providers** but **guardians of environmental and technological resilience**. Policy efforts must integrate their skills into formal systems through **legislative support, AI-enabled learning tools, and design reforms**.

UPSC Relevance: Key for **GS Paper 2 (Governance, Consumer Rights, Policy Implementation)**, **GS Paper 3 (Environment, Science and Tech, Digital Economy, E-waste)**, **GS Paper 4 (Ethics of Sustainability, Technological Equity)**, and **Essay and Interview** themes on *circular economy*, *digital inclusion*, and *sustainable innovation*.

6. India-U.K. CETA and the Dilution of India's Stance on Compulsory Licensing

• Background of CETA and TRIPS Commitments

The India–United Kingdom Comprehensive Economic and Trade Agreement (CETA) includes provisions under Chapter 13 (Intellectual Property) that favor *voluntary licensing* over *compulsory licensing* for ensuring access to medicines.

- This shift contradicts India's historical stance under the WTO's TRIPS Agreement, especially as upheld in the *Doha Declaration on TRIPS and Public Health (2001)*.
- Article 13.6 of CETA emphasizes voluntary mechanisms as the "preferable and optimal route," thus undermining legal flexibilities for developing countries.

• Compulsory Licensing under Indian Patent Law

India's **Patents Act, 1970** (amended in 2005 to comply with TRIPS) allows for *compulsory licensing* (CL) under Section 84.

- CL can be granted after three years of patent grant if:
    - The invention is not available at a reasonable price,
    - Public requirements are not met, or
    - The patent is not "worked" in India (i.e., not manufactured locally).

- In 2012, *Natco Pharma* was granted a CL for Bayer's cancer drug *sorafenib tosylate*, reducing the monthly cost from ₹2.8 lakh to ₹8,800.

• Concerns Over Dilution in Licensing and Reporting Norms
India's agreement under CETA reduces the frequency of reporting the "working" status of patents from *annually* to *once every 3 years*.

- This weakens India's ability to monitor patent exploitation and issue timely compulsory licenses.
- A similar concession was made in India's trade pact with the *European Free Trade Association* (EFTA).

• Impact on Access to Medicines and Public Health
Voluntary licenses often restrict the rights of domestic generic companies and are controlled by patent holders.

- Example: Under a voluntary license from Gilead for *remdesivir*, Cipla priced the drug higher in India (in PPP terms) than in the U.S.
- Médecins Sans Frontières (MSF) warns that voluntary licenses often come with conditions like API supply limits and territory restrictions.

• Technology Transfer and Global Climate Goals
India has historically demanded *technology transfer on favorable terms* to promote industrialization and meet climate obligations.

- This demand was central to the **New International Economic Order (1974)** and reiterated in India's **Fourth Biennial Update Report (2024)** to the *UNFCCC*.
- The CETA commitment undermines this demand, potentially weakening India's negotiation leverage in climate forums and multilateral trade bodies.

• Conclusion and UPSC Relevance
India's acceptance of CETA provisions risks undermining its own legal safeguards on public health and weakens its position in demanding equitable technology transfers. This may have long-term consequences on public health, affordability of medicines, and sustainable development goals.

UPSC Relevance:

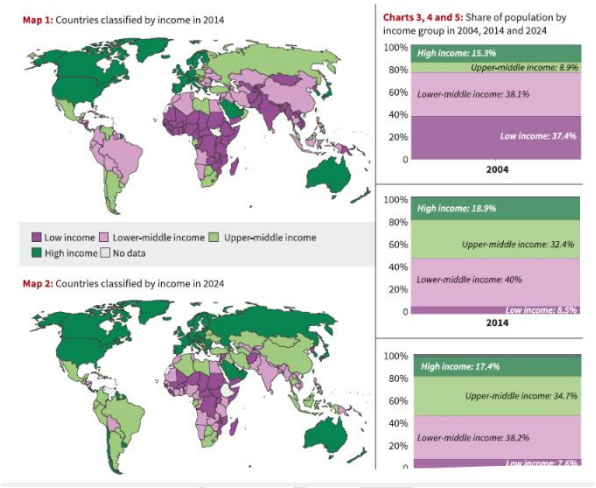
- Topics under **GS Paper 2**: Bilateral Trade Agreements, IPR, WTO-TRIPS, Public Health Policy
- Topics under **GS Paper 3**: Access to Technology, Climate Change Negotiations, Pharma Sector Reforms
- Ethics/Essay: Equity vs. Market Forces in Health Rights, Role of the State in Protecting Public Welfare

7. World Bank's Income Classification System

• Definition and Purpose of Income Classification
The World Bank classifies countries into four income groups based on **Gross National Income (GNI) per capita**:

- **Low-income**
- **Lower-middle-income**

- **Upper-middle-income**
- **High-income**
  This classification helps researchers, policymakers, and institutions compare countries using objective, income-based criteria. It is one of the most widely used economic groupings in global development data.



• GNI per Capita as the Basis of Classification
GNI per capita measures the average income of a country's residents, including income earned from abroad.

- GNI data is converted into U.S. dollars using exchange rates.
- The World Bank revises income thresholds annually based on **global inflation**, making the system **absolute**, not relative.

• Current Thresholds for 2024 (in USD)

- **Low Income**: $1,135 or less
- **Lower-Middle Income**: $1,136 to $4,495
- **Upper-Middle Income**: $4,496 to $13,935
- **High Income**: More than $13,935
  Countries are reclassified every year based on updated GNI figures, exchange rates, inflation, and population data.

• Historical Evolution and Link to Lending Policies
Originally introduced in the **late 1980s**, the income groupings aligned with the World Bank's concessional lending policies.

- The threshold between low-income and middle-income countries determined eligibility for low-interest or concessional loans.
- Over time, the classification evolved into a purely statistical tool, delinked from operational lending decisions.

• Dynamic Nature and Country Movements
Income classification is not static:

- Countries move **up** the ladder with sustained economic growth (e.g., China, India).
- Countries can also move **down** due to conflict or crisis (e.g., Syria, Yemen).
- In 2004, 37% of the world's population lived in low-income countries—this has now dropped to under 10%, while upper-middle income populations have increased to 35%.

• Important Concepts and Legal Context

- **Gross National Income (GNI)** includes GDP plus net income from abroad.
- Though not legally binding, the World Bank's classification is influential in shaping global **development financing**, **aid allocation**, and **policy research**.

- It also feeds into **United Nations** development programs and the **OECD** classification systems.

Conclusion and UPSC Relevance

The World Bank's income classification system is a fundamental tool for tracking global economic development and framing international aid and policy responses. It provides standardized data for comparing income levels across countries, understanding development gaps, and designing targeted interventions.

UPSC Relevance:

- **GS Paper 1**: World economic development trends
- **GS Paper 2**: Role of international institutions in development
- **GS Paper 3**: Economic growth indicators, GNI vs GDP, development statistics
- **Essay/Ethics**: Equity in global development, fairness in international aid distribution

8. Regulating Stablecoins in Hong Kong – A Strategic Step in Crypto Governance

• Definition and Nature of Stablecoins

- Stablecoins are a type of cryptocurrency designed to minimize price volatility by pegging their value to stable assets such as fiat currencies (e.g. USD, EUR), commodities (e.g. gold), or other cryptocurrencies.
- Unlike volatile cryptos like Bitcoin or Ethereum, stablecoins offer steady value and are often used in digital trade, remittances, and as stores of value in unstable economies.
- *Note*: Stablecoins are different from CBDCs (Central Bank Digital Currencies) which are issued by governments, whereas stablecoins are often privately issued.

• New Regulatory Framework in Hong Kong (Effective from August 1, 2025)

- The **Stablecoins Ordinance** mandates licensing for any entity offering fiat-referenced stablecoins (FRS) to retail investors in Hong Kong.
- Issuers must obtain licenses from the **Hong Kong Monetary Authority (HKMA)** and comply with:
  - Reserve asset management norms
  - Redemption and asset stabilization protocols
  - AML/CFT (Anti-Money Laundering and Counter-Financing of Terrorism) regulations
- Only a few licenses will initially be granted; mass issuance is discouraged.

• Need for Regulation

- Stablecoins play a crucial role in the crypto ecosystem (trading, remittances, hedge against inflation).
- Without regulation, there are risks of:
  - Fraudulent backing of reserves
  - Financial instability if large issuers fail
  - Regulatory arbitrage and use in illegal activities
- Cases like **Terra-LUNA crash (May 2022)** underline the risks of algorithmic or inadequately backed stablecoins, which triggered global financial repercussions.

• **Global Context of Stablecoin Regulation**

- The **U.S. passed the GENIUS Act (2025)** mandating 100% reserve backing for stablecoins, with monthly disclosures.
- **Japan and Singapore** have also established specific stablecoin laws.
- **China** restricts crypto activities domestically, but supports regulated innovation in **Hong Kong** to serve as a controlled financial innovation zone.

• **Key Terms and Constitutional/Legal Angle (India Perspective)**

- While India currently lacks a stablecoin-specific law, under the **Reserve Bank of India Act, 1934**, the RBI regulates foreign exchange and monetary policy.
- The **Prevention of Money Laundering Act (PMLA)** may be used to scrutinize crypto-related transactions.
- India's 2022-23 Union Budget introduced a **30% tax on crypto gains** and 1% TDS, showing early steps towards crypto governance.

• **Conclusion and UPSC Relevance**

- Hong Kong's stablecoin law reflects a maturing global regulatory environment where governments aim to harness digital finance while preventing systemic risk.
- For UPSC, this case demonstrates:
  ▪ The evolution of fintech regulations
  ▪ Balance between innovation and state control
  ▪ Comparative legal approaches to emerging technologies
  ▪ Relevance to topics under GS-3 (Economy, Science & Technology), GS-2 (Governance), and Essay paper (Tech & Ethics).

9. Push for Passage of Key Sports Bill Amidst Parliamentary Deadlock

• **National Sports Governance Bill, 2024: Core Objective**

- The Bill aims to introduce *greater transparency, accountability, and good governance* in the functioning of national sports bodies.
- It proposes reforms in the administration of sports federations, aligning them with international norms and ethical standards.
- The Bill is part of the government's attempt to professionalize and depoliticize sports governance in India.

• **Parliamentary Deadlock Context**

- The Monsoon Session of Parliament has witnessed a *legislative impasse* due to Opposition's demand for a discussion on the **Special Intensive Revision (SIR)** of electoral rolls in *poll-bound Bihar*.
- The government has refused this demand, leading to continuous protests and disruptions in both Houses.

• Other Key Legislative Developments

- **Rajya Sabha** is scheduled to consider *a resolution to extend President's Rule in Manipur* by another six months (effective from August 13), moved by Union Home Minister.
- The **National Anti-Doping (Amendment) Bill** is also listed for passage in Lok Sabha to strengthen anti-doping enforcement in Indian sports.

• Additional Bills in Government's Agenda

- **Readjustment of Representation of Scheduled Tribes in Goa Bill, 2024**: Aims to update assembly constituencies in Goa to reflect demographic changes.
- **Merchant Shipping Bill, 2024**: Proposes reforms in maritime regulations.
- **Indian Ports Bill, 2025**: Seeks to modernize and rationalize the administration of ports in India.

• Parliamentary Functioning Issues

- Except for a two-day discussion on the Pahalgam terror attack and **Operation Sindoor**, the Monsoon Session has seen minimal productive work.
- Further chaos was created by **Rajya Sabha Chairman Jagdeep Dhankhar's resignation** on the very first day of the session.

• Constitutional & Legal Provisions Involved

- **Article 356**: Relates to *President's Rule* in states (currently invoked in Manipur).
- The proposed sports and doping laws align with *international conventions* like the *UNESCO International Convention Against Doping in Sport*.
- Governance reforms in sports bodies may also touch upon *Article 19(1)(c)* (freedom to form associations) and *Article 21* (right to fair treatment).

Conclusion and UPSC Relevance

The government's move to introduce comprehensive reforms in sports governance through the National Sports Governance Bill reflects a broader trend of institutional reforms in India. This, alongside contentious political developments like the Bihar electoral roll revision and Manipur President's Rule, highlights ongoing tensions between governance, electoral processes, and federal dynamics.

UPSC Relevance:

- GS Paper 2: *Governance, Transparency, Government Policies, Federalism*
- GS Paper 4: *Ethics in Public Administration and Sports Management*
- Current Affairs: *Legislative Process, Parliamentary Functioning, Electoral Reforms*

10. Pakistan Supports Iran's Peaceful Nuclear Programme Amid Growing Bilateral Cooperation

• Pakistan's Endorsement of Iran's Peaceful Nuclear Rights

- Pakistan has publicly supported **Iran's right to develop nuclear technology for peaceful purposes**, including civilian energy needs.

- This endorsement comes amidst global scrutiny and tensions surrounding Iran's nuclear ambitions, particularly from the **U.S., Israel, and IAEA**.
- Prime Minister Shehbaz Sharif reiterated that **nuclear energy for peaceful use is Iran's sovereign right**, aligning with **Article IV of the Non-Proliferation Treaty (NPT)** which allows access to nuclear technology for peaceful purposes.

• High-Level Diplomatic Engagement

- The support was declared during **Iranian President Masoud Pezeshkian's** visit to Islamabad.
- Several **Memoranda of Understanding (MoUs)** were signed, with focus areas including trade, energy, border security, and regional connectivity.
- This marks a significant step in revitalizing bilateral relations post-Iran's leadership transition.

• Trade Expansion Target: $10 Billion Annually

- Both countries aim to enhance economic cooperation and **boost bilateral trade volume to $10 billion annually**.
- Sectors identified for cooperation include **oil and gas, electricity, cross-border trade, and agriculture**.
- The move comes as part of broader regional economic integration, especially under frameworks like **ECOTA (Economic Cooperation Organization Trade Agreement)**.

• Geopolitical Context and Iran-Israel Tensions

- The timing of this support is significant given the **escalating Iran-Israel tensions over nuclear capabilities**.
- Pakistan's position may be interpreted as a balancing act between its **historical alliance with Gulf countries** and its **strategic partnership with Iran**, especially in light of U.S. sanctions and West Asian dynamics.

• Legal and International Provisions Involved

- **Non-Proliferation Treaty (NPT)**: Iran, as a signatory, retains the right to peaceful nuclear technology under **Article IV**, while also bound by safeguards under **Article III**.
- Pakistan is *not* a signatory to the NPT but advocates non-discriminatory nuclear policies.
- **International Atomic Energy Agency (IAEA)** inspections and safeguards remain central to verifying Iran's peaceful intentions.

• Implications for India and the Region

- Strengthening of Iran-Pakistan ties may affect **India's strategic interests** in Chabahar port and regional connectivity projects.
- May influence dynamics in **West Asia, South Asia, and Afghanistan**, where both countries share borders and strategic stakes.

- Raises questions on **nuclear non-proliferation norms**, especially in a volatile region with nuclear-armed neighbors.

Conclusion and UPSC Relevance
Pakistan's endorsement of Iran's peaceful nuclear programme, along with growing bilateral trade ambitions, reflects a recalibration in regional geopolitics, especially amid Iran-Israel tensions and global nuclear diplomacy. It also underscores evolving regional alliances in West and South Asia.
UPSC Relevance:

- GS Paper 2: *International Relations (India's neighborhood, West Asia politics, bilateral and regional groupings)*
- GS Paper 3: *Security, Nuclear Policy, Technology and Energy Security*
- IR Current Affairs: *NPT, IAEA, Iran Nuclear Deal (JCPOA), Strategic Diplomacy*

11. NISAR Satellite – A Breakthrough in Earth Observation and Planetary Science

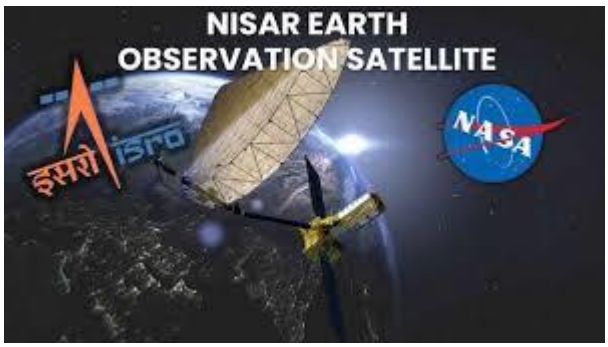
• What is NISAR?

- **NASA-ISRO Synthetic Aperture Radar (NISAR)** is a collaborative Earth observation satellite developed jointly by **ISRO and NASA**, launched on **July 31, 2025**.
- It is the **first satellite to use dual-frequency radars (L-band by NASA and S-band by ISRO)**, enabling extremely high-resolution monitoring of changes on Earth's surface—up to **sub-centimetre precision**.
- **Synthetic Aperture Radar (SAR)** allows it to image through clouds, smoke, and even darkness, unlike optical sensors.

• Core Applications and Capabilities

- NISAR will help monitor natural disasters like **earthquakes, volcanic activity, landslides**, and **glacial movements** by detecting millimetre-level surface changes.
- It will enhance **agricultural monitoring**, **deforestation tracking**, and **urban infrastructure assessment**.
- Pre-event signals like **bulging of volcanoes** or **land instability** can be detected, making it a vital tool for **disaster risk reduction**.

• Calibration and Technical Innovations



- ISRO and NASA calibrated their respective radar bands independently using **corner reflectors**, and post-launch alignment will be done using image-based referencing.
- The dual radar feeds (L-band and S-band) use a **common 40-foot deployable reflector**, optimised to handle both frequencies with minor correction during post-processing.
- This design enables **synthetic aperture imaging**, which builds up high-fidelity images from multiple snapshots, similar to a moving camera.

• Challenges and Engineering Milestones

- The project took **11 years** due to its **technical complexity**, COVID-19 disruptions, and challenges related to the **thermal vacuum testing** of the deployable antenna.
- Major milestones include dealing with overheating risks of the reflector and international coordination during the pandemic for hardware integration.

• Wider Scientific and Commercial Impact

- NISAR data is expected to benefit sectors like **agriculture, insurance, finance, transportation, and disaster management**.
- More than **200 early adopters** across industries are preparing to integrate NISAR data for real-time applications.
- The satellite's insights into Earth's crustal movements also contribute to **planetary science**, aiding missions to planets like **Mars** through better geophysical modelling.

• Key Terms and Legal/Institutional Provisions

- **Synthetic Aperture Radar (SAR)**: A radar technique used to create high-resolution images by using the motion of the radar antenna over a target region.
- **Earth Observation**: Satellite-based collection of information about Earth's physical, chemical, and biological systems.
- The mission is part of broader international cooperation under **bilateral agreements between ISRO and NASA**, aligned with peaceful space exploration under the **Outer Space Treaty, 1967**.

Conclusion and UPSC Relevance

NISAR is a landmark in international space collaboration, with profound implications for **climate resilience, natural disaster prediction, agriculture, and planetary science**. By combining India's S-band radar technology and NASA's L-band system, NISAR bridges Earth and planetary sciences through advanced SAR capabilities. Its success strengthens India's stature in global space research and technological diplomacy.

UPSC Relevance:

- GS Paper 3: *Science & Technology – Space Technology, Disaster Management, Environmental Monitoring*
- GS Paper 2: *International Cooperation – India-US Relations, Bilateral Space Agreements*
- Prelims: *NISAR, SAR, ISRO-NASA, Outer Space Treaty*
- Essay/GS Mains: *Role of Space Technology in Sustainable Development, Risk Reduction, and Scientific Advancements*

12. AI-Designed Proteins Boost T Cell Generation for Immunotherapy and Vaccination

• Breakthrough Use of AI in Immunotherapy

- A team of scientists led by Harvard Medical School used **AI-designed proteins** to **generate immune cells**, especially **T cells**, which play a central role in fighting **cancer and viral infections**.

- These proteins **activate the Notch signalling pathway**, a crucial biological mechanism responsible for immune cell development and tissue homeostasis (i.e., maintaining internal stability in the body).

• What is Notch Signalling?

- **Notch signalling** is a **cell-to-cell communication system** essential for the **differentiation of stem cells into T cells** and for maintaining tissue balance.
- Activation of this pathway had been limited in the past because there were **no soluble molecular activators** effective inside the human body (*in vivo*).

• AI and Nobel-Winning Innovation

- The study used **AI-driven protein design technologies**, a field for which **David Baker, Demis Hassabis, and John Jumper** received the **2024 Nobel Prize in Chemistry**.
- A library of **custom-designed soluble Notch agonists** (activator molecules) was created using AI and tested for efficiency in T cell production.

• Application in Cancer and Vaccine Therapy

- These AI-designed proteins allowed **large-scale T cell production** in laboratory bioreactors, significantly aiding **CAR-T cell therapy**, a cutting-edge cancer immunotherapy.
- When injected into mice during vaccination, the agonists improved **T cell responses** and **memory T cell production**, enhancing **long-term vaccine effectiveness**.

• Advantages Over Traditional Techniques

- Earlier methods required immobilised Notch ligands on culture dishes, making them unsuitable for human therapy.
- This new approach is **scalable, soluble, and functional in vivo**, potentially transforming **immunotherapy, vaccine science, and regenerative medicine**.

• Key Definitions and Legal/Constitutional Relevance

- **Immunotherapy**: A medical treatment that stimulates or restores the immune system to fight diseases like cancer.
- **CAR-T Cell Therapy**: A form of gene therapy in which a patient's T cells are modified to attack cancer cells.
- No direct constitutional article applies, but under **Directive Principles of State Policy (Article 47)**, the State must improve public health, which advances like this directly support.
- Also aligns with **National Health Policy 2017** goals on leveraging biotechnology and AI for health equity.

Conclusion and UPSC Relevance

This development represents a powerful convergence of **AI, biotechnology, and regenerative medicine**, enabling unprecedented control over immune cell production. By solving a longstanding limitation in Notch signalling activation, the innovation holds promise for **personalised medicine, pandemic preparedness, and cancer treatment**. The contribution of Indian-origin scientist Dr. Rubul Mout further underlines global Indian talent in frontier science.

UPSC Relevance:

- GS Paper 3: *Science and Technology – AI in healthcare, Biotech innovations, Immunotherapy*
- GS Paper 2: *Health Sector – Public Health Research, Role of Science in Policymaking*
- Prelims: *Notch Signalling, CAR-T Cell, AI-designed proteins, Nobel 2024*
- Essay/GS Mains: *Use of AI in Health and Ethics, India's Role in Global Scientific Innovations*